METHOD OF MAKING SERVICES OFFERED BY A PRIVATE COMMUNICATION NETWORK DYNAMICALLY AVAILABLE TO A TERMINAL CONNECTED TO A PUBLIC COMMUNICATION NETWORK

The field of the invention is that of communication between terminals within networks, and more particularly the provision of services offered by private networks to terminals connected to a public communication network.

Many private communication networks, for example private automatic branch exchanges (PABX), offer services to the communication terminals connected to them. These services include in particular call forwarding, access to directories or databases, storage of messages, conference calls and voice or written notepads. These services are accessible to terminals when they are connected directly to their own private network, of course. However, if terminals are far away from the private network, they are able to access certain of their services only if said private network is connected to a public network via a communication server such as a gateway, and subject to particular arrangements.

One particular arrangement is assigning to certain keys of the terminal's keypad functions corresponding to particular services. Pressing one of these keys sends to the gateway a preprogrammed dual tone multifrequency (DTMF) data sequence on a public network transmission channel dedicated to the exchange of voice data. Consequently, if a user wishes to access a service when he has already set up a voice connection to another terminal, he must first of all temporarily break off his connection, then set up a connection with the server for the latter to make said service available to him, and finally re-establish the original connection to the other terminal. Moreover, during a voice connection with another user, this rules out dynamically offering the user services adapted to certain events that may arise during a call, for example a higher priority incoming call, a text message that needs to be displayed during a call, or a request to enter a conference call. Moreover, only the services associated with the preprogrammed functions may be made available to terminal users. This arrangement is therefore "static", making it ill-suited to the requirements of real time processing.

A second arrangement, described in patent application

EP 1 107 523, consists first of all in setting up, on a public network transmission channel dedicated to signaling, a connection between a terminal wishing to access services of its own private network and a gateway connected to that private network, and then sending a Word Markup Language (WML) page offering its user a certain number of services to the calling terminal via the gateway. When the user has made his choice, his terminal sends to the gateway a WML command and, following specific data exchange protocol format conversion processing, the terminal is able to access the chosen service. Because the user has to make his choice from a predefined list of services, it is not possible, during a voice connection with another user, to offer the user dynamically services adapted to certain events that may arise during a call. This arrangement is therefore also "static", making it ill-suited to the requirements of real time processing.

Thus an object of the invention is to remedy some or all of the problems referred to hereinabove.

To this end it proposes a communication server installed between one or more first (public and/or private) communication networks and a second private communication network adapted to offer a multiplicity of services to terminals, said server being adapted to set up links in accordance with a selected protocol (for example the Wireless Application Protocol (WAP)), with communication terminals, for example mobile telephones, connected to one of the first networks and adapted to exchange simultaneously signaling data on a first transmission channel and voice data on a second transmission channel.

The server, which is an access gateway, for example, is characterized in that it comprises control means capable of sending to a terminal connected to the first network, on a first channel and as a function of a selected criterion, configuration data (constituting a script or an applet, for example) to enable the terminal to set up a connection with the server on the first channel, when it has already set up a voice connection on a second channel, to make available to its user, during the voice connection, at least some of the services offered by the second network to which it is connected.

The invention therefore provides the full benefit of the architecture of certain communication networks, such as GPRS and UMTS networks, in

which different transmission channels are used for signaling data and content data or "media" data, in particular voice data.

The control means are preferably adapted to transmit configuration data to a terminal when the terminal has previously set up a connection with the server using a selected primary identifier, such as a dedicated telephone number. In this case, setting up this connection beforehand constitutes the selected criterion.

The control means may preferably be adapted to effect an identification procedure before sending said configuration data. In this case, the server includes a memory for storing secondary identifiers, for example the International Mobile Station Identity (IMSI), stored in the SIM card of the terminal, and the control means are adapted to send to the terminal identification data which, once installed in the terminal, automatically sends to the server at least the second identifier stored in the terminal, then compares the received secondary identifier to the identifier stored in the memory, and sends the appropriate configuration data to the terminal if the identifiers are identical. The control means may also send security data to the terminal after sending the configuration data.

The configuration data may preferably be adapted, when activated by the user, to prompt the user to enter at least one tertiary identifier, for example his password or user name, in order to send a request to register the terminal and comprising at least the tertiary identifier supplied by the user (and security data, where applicable) to the control means, also on the first channel. In this case, it is advantageous to store the primary identifiers in the memory of the server in corresponding relationship to at least one tertiary identifier (and security data, where applicable), so that on receiving a request for registration the control means may first of all send to the configuration data installed in the terminal a request to send at least the primary identifier associated with the terminal, and then compare the primary identifier and the tertiary identifier received to the identifier stored in the memory, in order to authorize or refuse registration as a function of the result of the comparison.

The configuration data may preferably be adapted to extract certain information from the message in order to send it to the control means via the first channel, doing this immediately the terminal receives a call

request message from the first network and preferably when the terminal has been registered. In this case, on receiving the extracted information, the control means may process it as a function of its content, and then send a message selected as a function of the processing applied and the information received, and where applicable containing information to be displayed on the screen of the terminal, to the terminal, also on the first channel.

In the same way, and preferably after registration of the terminal, the configuration data may be adapted so as to inhibit access to the first network immediately the user attempts to call a remote terminal and then to send to the control means information including at least the primary identifier (or telephone number) of the remote terminal, also on the first channel. In this case, on receiving the extracted information, the control means may process it as a function of its content and then send a message selected as a function of the processing applied and the information received and containing at least one authorization or prohibition to make the call, and where applicable information to be displayed on the screen of the terminal, to the terminal, also on the first channel, so that on receipt of this message the configuration data removes the inhibition on access to the first network with a view to setting up the call, or prohibits the call.

The invention also provides a method of making available to terminals connected to a first communication network and able to exchange simultaneously signaling data on a first transmission channel and voice data on a second transmission channel services offered by a second private communication network, via a communication server and in accordance with a selected protocol.

The method consists in the server sending to a terminal connected to the first network, on a first channel and as a function of a selected criterion, configuration data (constituting a script or an applet, for example) for setting up with the server a connection on the first channel during a voice connection on a second channel, in order to make at least some of the services offered by the second network to which it is connected available to the terminal during the voice connection.

The method of the invention may have many complementary features implemented separately and/or in combination, and in particular:

- the configuration data may be sent to a terminal after the terminal has set up a connection with the server using a selected primary identifier; in this case, setting up this connection constitutes the selected criterion;

- an identification procedure may be effected before sending the configuration data; in this case, it is preferable to store secondary identifiers beforehand in a memory of the server so that it is possible to start by sending to the terminal identification data which, once installed in the terminal, automatically sends to the server at least one secondary identifier stored in the terminal, after which this secondary identifier is compared to the identifier stored in the memory and the appropriate configuration data is sent to the terminal if the identifiers are identical;

- the server may also send security data to the terminal when the configuration data has been sent to it;

- the configuration data may be adapted, in the event of activation of the terminal by the user, to prompt the user to supply at least one tertiary identifier and to send to the server, on the first channel, a registration request containing at least the tertiary identifier; in this case, it is preferable to store the primary identifiers in the memory of the server in corresponding relationship to at least one tertiary identifier; accordingly, on receiving a registration request, the server sends to the configuration data a request to send at least the primary identifier associated with the terminal, after which the primary identifier and the tertiary identifier received are compared in the server to the identifier stored in its memory, in order to authorize or refuse registration as a function of the result of the comparison;

- the configuration data may be adapted, in the event of reception of a call request message from the first network, and preferably after the terminal has been registered, to extract certain information from the message and send it to the server on the first channel; accordingly, on receipt of the information, it may be processed as a function of its content and then a selected message sent to the terminal, on the first channel, as a function of the processing applied and the information received, where applicable with information to be displayed on the screen of the terminal;

- the configuration data may be adapted, if the terminal attempts to call a remote terminal, and preferably after the terminal has been registered, to inhibit access to the first network and to send to the server on

the first channel information including at least the secondary identifier of the remote terminal; accordingly, on receipt of the information, it may be processed as a function of its content, after which there is sent to the terminal, on the first channel, a message selected as a function of the processing applied and the information received and containing at least one call authorization or prohibition and where applicable information to be displayed on the screen of said terminal, so that on receipt of this message the configuration data removes the inhibition of access to the first network with a view to setting up or prohibiting the call.

The invention also provides a communication network comprising at least one first communication network connected to at least one second private communication network via a communication server of the type described hereinabove.

The invention may be implemented in public communication networks selected from PSTN, PLMN and Internet protocol (IP) networks, and in particular in public mobile communication networks selected from GSM, GPRS and UMTS networks, and in private networks selected from PABX and residential gateways adapted to use fixed access, and wireless networks such as WLAN, Bluetooth and UMTS networks. Moreover, the invention applies very particularly to connections between a first network and a server that use the WAP or the SIP in varied formats such as the XML, WML, HTML, WTAI formats or proprietary formats.

Other features and advantages of the invention will become apparent on reading the following detailed description and examining the appended drawings, in which:

- figure 1 shows diagrammatically one example of an installation of the invention, and

- figure 2 is a block diagram showing connections between main functional modules of a communication terminal of the figure 1 installation.

The drawings constitute part of the description of the invention and may, if necessary, contribute to the definition of the invention.

The installation shown in figure 1 comprises a first public network (PLMN), which is a public communication network belonging to a first mobile telephone carrier and connected to a services server 1, a second public network (PSTN), which is a public communication network belonging to a

second telephone carrier and connected to the main network PLMN and to said services server 1, a third public network which is an Internet type public network also connected to the main network PLMN and to the services server 1, and a private network RP connected by a gateway 2 to the services server 1.

In this example, the first and second public networks are respectively a public land mobile network (PLMN), for example a GSM network, and a public switched telephone network (PSTN). The private network is a private automatic branch exchange (PABX), for example, possibly of the wireless type (if it conforms to the DECT standard). However, the invention is not limited to these network types or to the number of networks selected, of course. To implement the invention, the installation must comprise at least one private network offering services specific to its users and one public communication network comprising a multiplicity of base stations 3 known as base transceiver stations (BTS) in a GSM (or GPRS) network and known as Nodes B in a UMTS network, with which communication terminals 4 may simultaneously exchange signaling data on a first transmission channel and voice data on a second transmission channel, in accordance with a selected protocol.

The communication terminals 4 are fixed or mobile telephones, for example, fixed or portable (micro)computers, or personal digital assistants (PDA), with which are associated primary identifiers such as telephone numbers or addresses, or any other unique identifier for setting up a connection with them. The terminals 4 belong to users of the private network RP, for example the staff of a business. The primary identifiers of the terminals 4 are therefore known to the private network RP. To be more precise, the gateway 2 includes a first memory 5 for storing the primary identifiers of the user terminals authorized to use services offered by the private network RP.

Hereinafter, and by way of example, the PLMN is a GPRS network and the selected exchange protocol is the wireless application protocol (WAP). However, other types of public network may be envisaged, of course, for example UMTS networks, and other types of protocols may be envisaged, for example SIP. Also, the terminals 4 are mobile telephones, for example.

The network and the protocol being very well known to the person

skilled in the art, they are not described in detail here. Nevertheless, to facilitate an understanding of what follows, figure 2 shows the connections between the main functional modules of a WAP mobile telephone 4.

The abbreviation MMI stands for 'man-machine interface'.

5 The abbreviation WAE-UA stands for 'wireless application environment - user agent'. The user agent is a circuit or software for interpreting resources, such as WML or WMLScript. It may comprise a text or voice browser or a search engine.

The abbreviation WTA-UA stands for 'wireless telephony application - 10 user agent'. The user agent is an extension of WAE-UA capable of interfacing the telephone 4 with services of the network that interact with the components of the architecture supporting WTA services.

The abbreviation WTAI stands for 'wireless telephony application interface' (WTA interface).

15 The abbreviation PWTAI stands for 'public wireless telephony application interface'.

The abbreviation REP stands for Repository (archival storage). This (non-volatile) memory contains in particular resources (data, network objects or services identifiable by a URL) collected in the transmission 20 channels.

The abbreviation DSF stands for 'device specific features', meaning features of the telephone 4.

The abbreviation NL stands for 'network layer'.

The units or modules designated by the abbreviations WAE-UA, WTA- 25 UA, PWTA, WTAI, REP, DSF and NL constitute communication management means of the terminal 4.

The WTA-UA is able in particular to extract data from the memory REP and the WTAI allows the WTA-UA to interact with the functions of the mobile network (for example call set-up) and with the specific features of 30 the mobile telephone 4 (for example use of the address book). Also, the WTA-UA receives events from the network that may relate to its content, thereby enabling dynamic telephony applications. These events received from the network are the result of actions effected by services that function within the WTA-UA. Telephony events initiated outside the mobile telephone 35 4 are also transmitted to the WTA-UA. This applies in particular to text

messages coming from a network that are not directed to another user agent (for example events relating to the SIM card).

The WEA-UA extracts information only from external WAP servers, such as the server 1, and has access only to functions offered by WTAI public libraries (for example the call placing function).

Detailed characteristics for the above units and modules can be found at "www.wapforum.org".

The object of the invention is to enable mobile telephones 4 to access dynamically services offered by their own private network RP when they are connected to one of the public networks, for example the PLMN.

To this end, the gateway 2 of the private network RP includes a control module 6 connected to a second memory 7 storing configuration data preferably taking the form of WTA format scripts (or applets). Once installed therein, the WTA scripts assume control of the mobile telephones 4 to enable exchange of signaling data with the gateway 2 via a first transmission channel (or signaling channel).

The control module 6 is also coupled to the first memory 5, which stores a table of the correspondences between the primary identifiers of the mobile telephones authorized to access the services of the private network RP and associated secondary identifiers (see below). The control module 6 may take the form of electronic circuits, software (or data processing) modules, or a combination of circuits and software.

As indicated above, the gateway 2 is adapted to set up connections with the various networks, and in particular to exchange data on the signaling channel. Moreover, the gateway 2 is associated with a primary identifier (or address), such as a uniform resource locator (URL) enabling another server or a mobile telephone 4 to set up a connection with it.

According to the invention, if the user of a mobile telephone 4 connected to the private network RP wishes to use for the first time services offered by that network, he enters the URL of the gateway 2 into his telephone 4 in order to set up a connection therewith. Once the connection has been set up, the control module 6 of the gateway 2 sends to the mobile telephone 4, via the signaling channel, an indication of the scenario to be executed, previously stored in the terminal or sent to it, preferably a first WTA

script (or configuration data) for automatically extracting from the telephone 4 one or two secondary identifiers. This first WTA script is stored in a memory area of the terminal controlled by the WTA-UA.

A preferred first secondary identifier is the user identification (IMSI) number stored in the SIM card 8 and a second preferred secondary identifier is the international mobile equipment identity (IMEI) number of the telephone stored in the terminal.

After the secondary identifier(s) have been extracted, the WTA-UA sends all or part of this information to the gateway 2 via the signaling channel. On receiving these secondary identifiers, the control module 6 compares them to the identifier stored in the correspondence table of the first memory 5. In the event of identity with the identifier stored in corresponding relationship to the primary identifier of the telephone 4, the control module extracts from the second memory 7 a second WTA script or a second script identifier previously stored in the terminal and sends it to the WTA-UA of the telephone 4 via the signaling channel. If the second WTA script is sent, it is then stored in the REP (repository) memory of the communication management means 9.

It is then preferable if the control module 6 sends security information such as a calculated authentication key to the WTA-UA of the telephone 4, via the signaling channel. The control module 6 of the gateway 2 subsequently uses this information to determine the status of the connection, even if there are no active exchanges on GPRS transmission channels.

Armed with the WTA scripts and security information, the telephone 4 is then in a position to access the services offered by its own network RP automatically, via the gateway 2. While this access may be automatic, for security reasons, the user may be required to register with the control module 6 each time he wishes to use the services.

To do this, the user must first activate the stored WTA script. The script then preferably prompts the user to furnish a tertiary identifier, for example a password and/or a user name, and then sends the tertiary identifier to the control module 6 via the signaling channel. In this case, the tertiary identifiers are also stored in the table of the first memory 5, in corresponding relationship to the primary and secondary identifiers. The script then sets up a connection with the gateway 2 via the signaling channel, in order to send

it the secondary and tertiary identifiers, and where applicable security information (which may have changed simultaneously in the telephone 4 and in the gateway 2, as a result of exchanges between the gateway and the telephone).

5   On receipt of the secondary and tertiary identifiers, the control module 6 verifies that they correspond to those stored in the first memory 5 in corresponding relationship to the primary identifier of the telephone 4. If this is the case, the registration procedure is complete and the telephone 4 is able to use the services offered by the private network RP at any time. In

10   other words, the script installed in the telephone 4 may, from this time on, set up a connection with the gateway 2 on the signaling channel, even if the telephone has set up a voice connection on the transmission channel dedicated to the exchange of voice data. Each time that the script sets up a connection with the gateway 2, the latter may monitor the menus and

15   information displayed on the screen of the telephone 4 before or during calls on the voice channel and offer the user services appropriate to the circumstances, for example storage of messages, access to directories, access to voice or written notepads, conference calls, call filtering, call transfer, call broadcasting, etc.

20   This is all the more beneficial if the telephone has a "hands free" system and/or an operating assistant independent of voice processing.

When the user no longer wishes to access the services, he has only to deactivate the script, which sends to the control module 6 a message requesting it to cancel the registration of the telephone 4.

25   Once the terminal has been registered, the WTA script can act at any time. In particular, it can act following an action of the user, for example to set up a connection with a remote terminal (or server) manually or by voice control (without lifting the handset). It can also act after an action of the PLMN to which the mobile terminal 4 is connected, for example an

30   incoming call or a conference call request or the arrival of a short message service (SMS) text message. It can also act after an action of the gateway 2, for example to display information, or on a location request, or on sending an SMS mini-message, or on event recall. It may act at its own initiative, for example to request parameters or to carry out tests or apply time delays.

35   Two examples of the intervention of a WTA script are described in

more detail below. In these examples, the terminal 4 has been registered beforehand with the gateway 2 and the WTA script that it comprises has been activated. However, as indicated above, this registration procedure is not obligatory.

A first example relates to outgoing calls from the mobile terminal 4 equipped with a WTA script. The user first gives his terminal 4 the primary identifier of the remote terminal with which he wishes to set up a call (or connection or session). This may be effected by voice control, selecting a name from an address book or entering a number via the keypad (or MMI). The primary identifier reaches the WTA-UA and therefore the WTA script, which inhibits access to the PLMN and then sends to the control module 6 of the gateway 2, via the signaling channel, an information message containing at least the primary identifier designating the remote terminal that the user wishes to call. This message may also include a request to set up the call via the private network RP, for example to obtain a special rate or to communicate information specific to the business, such as the presentation of the company name.

On receipt of the information message, the control module 6 can process the data that it contains. It can in particular determine if the called party is on the private network RP (in which case the call is a local call) or not (in which case the call is an external call). It can also decide to authorize or prohibit the requested call, for example because of the type of terminal called. It can also perform the operations necessary for the call to be processed by the private network RP, for example sending ringing tone to the calling terminal 4 and ringing the called terminal, followed by setting up the connection between the two terminals. It can also place information in a call log, for example the called number, the time of the call, the call duration and the like.

When the processing is finished, the control module 6 generates a message to the mobile terminal 4 as a function of the processing applied and the information received and containing at least the authorization or prohibition of the call. This message is sent on the signaling channel and can also contain information to be displayed on the screen of the calling terminal 4 and/or the called terminal, for example the called party number or the status of the called terminal (available or busy). On receipt of this

message, and if the call is not effected via the gateway 2, the WTA-UA communicates it to the WTA script which, after consulting and/or using the memory REP, either removes the inhibition on access to the PLMN with a view to setting up the call or prohibits the call, and where applicable initiates a procedure for displaying information on the screen of the terminal 4.

A second example concerns incoming calls via the PLMN to the mobile terminal 4 equipped with a WTA script. As soon as the WTA-UA receives the call request message, it sends it to the WTA script which extracts from it information such as, for example, the primary identifier of the terminal of the caller, in order to send the information in the form of a message to the control module 6 via the first channel. On receipt of the extracted information, the control module 6 is able to process it. It can in particular determine if the caller is on the private network RP (in which case the call is a local call) or not (in which case the call is an external call). It can also apply filtering, for example, and decide to authorize or prohibit the requested call. It can also place information in a call log, for example the called number, the time of the call, the call duration and the like.

When the processing is finished, the control module 6 generates a message to the mobile terminal 4 as a function of the processing applied and the information received, and where applicable containing information to be displayed on the screen of the called terminal 4, for example the number and/or name of the calling party, an indication of whether the calling party is on the private network, or the characteristics of the associated ringtone. On receipt of this message, the WTA-UA communicates it to the WTA script which, after consulting and/or using the memory REP, either sets up or prohibits the call, and where applicable initiates a procedure for displaying information on the screen of the terminal 4.

Thanks to the invention, it is also possible to implement other functions dynamically because, the WTA script exchanging data with the gateway 2 via the signaling channel, the user can simultaneously conduct a dialog with a remote terminal via the voice channel. The control module 6 can therefore at any time offer the user actions or menus adapted to events that may occur during the call, on the screen of his terminal 4 and through the intermediary of the WTA script. By way of nonlimiting example, it can in

particular offer the terminal 4 a higher priority incoming call, a text message that has to be displayed during the call, a request to enter a conference call, access to private databases, access to directories of the private network, an incoming call transfer, storage of messages, access to a voice

5   or written notepad, and the like.

The invention therefore adapts the functions offered to a user dynamically, as a function of the current situation, in particular by controlling information displayed on the screen of the user's terminal before and during a call.

10   The invention also offers a method for making services offered by a private second communication network RP, via a communication server 2 and in accordance with a selected protocol, available to terminals 4 connected to a first communication network (PLMN) and able to exchange simultaneously signaling data and voice data on a signaling channel and a

15   voice channel, respectively.

This method may be implemented using the device described hereinabove. The main and optional functions and subfunctions of the steps of the method being substantially identical to those of the various means constituting the installation, only the steps implementing the main functions

20   of the method of the invention are summarized hereinafter.

The method consists in having the server 2 send to a terminal 4 connected to the first network PLMN, on a first channel and as a function of a selected criterion, configuration data (constituting a script or an applet, for example) for setting up a connection with the server 2 on the first

25   channel, during a voice connection on a second channel, so as to make at least some of the services offered by the second network RP to which it is connected available to the terminal 4 during the voice connection.

The configuration data may be sent to the terminal 4 after the terminal has set up a connection with the server 2 using a selected primary

30   identifier.

An identification procedure may be executed before transmitting the configuration data.

A procedure may be provided for registering the terminal 4 with the server 2 via the first signaling channel before making the services of the

35   private network RP available to said terminal.

The invention is not limited to the embodiments of the method, server and installation described hereinabove by way of example only, but encompasses all variants that the person skilled in the art might envisage that fall within the scope of the following claims.

5   Thus reference is made above to WAP exchanges between connections between a first network and a server, but the invention applies equally to SIP and more generally to exchanges between public networks and nodes of private networks. Similarly, in terms of transport, a WLAN wireless network or a Bluetooth network may be used.